

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to improvement of the cleaning device applied to such an image forming device in more detail about the image forming device which used electrophotographing systems, such as a copying machine, a printer, facsimiles, and these composite machines.

[0002]

[Description of the Prior Art] The image forming device of the electrophotographing system which forms a toner image in record sheets, such as paper and an OHP sheet, from the former according to electrophotography processes, such as electrification, exposure, development, transfer, and fixing, to picture support, such as a photo conductor drum, is known widely. In order to clean the offset toner adhering to the surface of the photo conductor drum 100 grade after transfer, etc., the cleaning device of the blade cleaning system which a braid is made to contact longitudinal directions, such as a photo conductor drum, by a predetermined pressure, and is cleaned is also known widely.

[0003] As a technical problem from the former of the cleaning device of such a blade cleaning system, the problem of balance with maintenance of cleaning performance and the prevention from wear of a photo conductor drum (picture support) is mentioned. Namely, if such a cleaning device is used temporally, toners etc. will gather for the contact part of a photo conductor drum and a cleaning blade (edge part) gradually. It was in the nectar filling state, the braid was pushed up eventually, and there was a problem that there was a possibility of causing cleaning defect. On the other hand, although such temporal cleaning defect can be prevented to some extent by heightening the contact pressure of a photo conductor drum and a cleaning blade, Another problem of wearing a photo conductor drum out by friction with a cleaning blade might be caused.

[0004] In order to reconcile the prevention from wear with maintenance and the photo conductor drum (picture support) of such cleaning performance, lubricant is supplied to the photo conductor drum surface from the former, and lowering the coefficient of friction of the photo conductor drum 100 surface is performed.

[0005] For example, the art which equips JP,7-210051,A and JP,5-53485,A with the lubricant supplying means which supplies lubricant to the upstream of the direction of photo conductor drum rotation of the cleaning blade which contacts a photo conductor drum is proposed. The art which equips JP,60-22587,A and a JP,5-53485,A gazette with the lubricant supplying means which supplies lubricant to the downstream of the direction of photo conductor drum rotation of the cleaning blade which contacts a photo conductor drum is proposed.

[0006]

[Problem(s) to be Solved by the Invention]However, the respectively following technical problems were held in such art. Namely, in the art which supplies lubricant from the upstream of a cleaning blade, In order to supply lubricant to the photo conductor drum surface before cleaning, a lubricant supplying means will be polluted with the non-transfer toner (henceforth offset toner) adhering to the photo conductor drum surface, etc., and it will be difficult to supply lubricant appropriately. since the lubricant supplied on the other hand in the art which supplies lubricant from the downstream of the cleaning blade moves with rotation of a photo conductor drum as it is (without passing a cleaning blade), it will be difficult to make uniform quantity of lubricant of the photo conductor drum surface. Then, for example, there is a possibility that electric discharge of the photo conductor drum surface and electrification become uneven and of having an adverse effect on other electrophotography processes -- excessive lubricant mixing in a developer.

[0007]This invention is made in view of such a technical problem, and the purpose is to provide the cleaning device of the image forming device which supplies lubricant of a quantity stable over the long period of time.

[0008]

[Means for Solving the Problem]The first picture support that this invention holds a toner image on the surface, and rotates, In a cleaning device which is applied to an image forming device provided with a transfer device which transfers the toner image to the second picture support, and cleans the first picture support surface, A cleaning blade to which the cleaning device concerned contacts the surface of the first picture support, A lubricant supplying means which is provided in the downstream of the first picture support hand of cut rather than the cleaning blade concerned, and supplies lubricant to the first picture support surface, It is provided in the downstream of the first picture support hand of cut rather than the lubricant supplying means concerned, and has an equalization means to equalize lubricant supplied to the first picture support surface (claim 1).

[0009]In order to supply lubricant to the first picture support surface after removing offset toner etc. by a cleaning blade by having such composition, a lubricant supplying means is not polluted. Supplied lubricant is uniformly used as the first picture support surface with \*\* by an equalization means. Such a cleaning device can supply lubricant of a quantity stable over a long period of time. In an image forming device provided with such a cleaning device. Since a high-definition picture can be maintained since quantity of lubricant supplied is stable, and maintenance of cleaning performance and prevention from wear of picture support are achieved further, it also becomes possible to lessen the maintenance frequency.

[0010]Here, although the toner used can choose suitably a publicly known thing manufactured by a mechanical kneading grinding type toner process etc., in applying to a cleaning device

concerning this invention, a toner manufactured by the emulsification condensation uniting method or a suspension polymerization method can also be chosen. A toner manufactured by the these emulsification condensation uniting method or a suspension polymerization method is the spherical toner to which a byway and globular form distribution were equal, for example, the mean particle diameter is 3-10. [ $\mu\text{m}$ ] It is a grade and the profile coefficient is 100-150.

$[\text{ML}^2/\text{A}]$  ( $\text{ML}^2/\text{A} = (\text{particle maximum length} / 2)^2 \times \text{pix}100 / (\text{particle real project area})$ ):

Measurement is the grade which used roux ZEKUSU.

[0011] Although a toner manufactured by such the emulsification condensation uniting method and a suspension polymerization method has the advantage that image quality of a toner image is excellent in fields, such as sharpness and resolution, in one side, In another side, adhesion force strong between a toner and picture support arises, and it has the fault of being easy to cause cleaning defect. If such a toner is applied to a cleaning device concerning this invention, by operation of lubricant which exists in the first picture support surface uniformly. Since it is stabilized and adhesion force produced between a toner and the first picture support can be weakened over a long period of time, it is hard to produce cleaning defect, and a high-definition picture can be acquired by being stabilized over a long period of time.

[0012] The first and second picture support is relative respectively. the [ for example, / \*\* ] -- picture support of one -- a photo conductor -- the second picture support -- the [ an intermediate transfer body and / \*\* ] -- picture support of one -- a photo conductor -- the second picture support -- the [ a record sheet and / \*\* ] -- picture support of one may be [ the second picture support ] a record sheet etc. in an intermediate transfer body. A photo conductor and the intermediate transfer body record sheet can choose a publicly known thing suitably, respectively, and can apply it, and a thing of endless belt shape [ thing / drum-like ] may be sufficient as each of photo conductors and intermediate transfer bodies.

[0013] A cleaning blade chooses suitably publicly known materials, such as polyurethane rubbers, silicone rubber, nitrile rubber, and chloroprene rubber, for example, and the elastic modulus, thickness, a contact angle to the first picture support, etc. can be set up suitably, and can be used for it.

[0014] Although the lubricant supplying means can contact a rotary brush and a roll kneader which contact the first picture support, for example in solid lubricant and lubricant can also be supplied to the first picture support via these rotary brushes, Composition which supplies lubricant in contact with the first picture support directly from viewpoints of a miniaturization of a device, low-cost-izing, etc. is preferred.

[0015] As lubricant to supply, fatty acid metal salt can be used and it can be used according to a supply mode to the picture support, being able to form in powder and a solid state. As a metallic element which constitutes the fatty acid metal salt, For example, zinc, lithium, sodium, magnesium, aluminum, lead, nickel, etc. can be mentioned, and stearic acid, lauric acid,

pulmitic acid, etc. can be mentioned as fatty acid which constitutes the fatty acid metal salt, for example.

[0016]A braid, a rotary brush, a roll kneader, etc. can constitute an equalization means suitably. For example, when a braid constitutes, the same composition as a cleaning blade can be adopted. When a rotary brush constitutes, hair can be transplanted throughout the surface of the metallic shaft in what made nylon, polypropylene, an acrylic, etc. fibrous, using a metallic shaft as a core material. When a roll kneader constitutes, using a metallic shaft as a core material, the circumference is covered by elastic members, such as urethane foam, and it forms in rolled form, and the rolled form elastic member can be made to be able to contact the first picture support surface, and can be rotated.

[0017]While the above-mentioned equalization means is constituted by braid which contacts the surface of the first picture support, this invention, It is powder object-like lubricant which is provided with a base material which forms a closed space by the above-mentioned cleaning blade, the above-mentioned equalization means, and the first picture support and in which it fills up with the above-mentioned lubricant supplying means in the closed space concerned (claim 2). By constituting a cleaning device in this way, solid state lubricant is contacted by the first picture support surface with an equalization means (braid) or a base material, and a lubricant supplying means can be constituted simply. This base material may be constituted by two or more parts [ what / is constituted by parts of 1 ].

[0018]Maintenance of a cleaning device can be easily performed by constituting this solid state lubricant from a cartridge type which can be taken freely to a closed space formed by picture support of the above first, a cleaning blade, equalization means (braid), and a base material. Of course, composition held by a base material with separate cleaning blade and equalization means is also possible.

[0019]In this invention, the above-mentioned lubricant supplying means comprises solid state lubricant which contacts the first picture support surface, and a base material holding the solid state lubricant (claim 3). In this cleaning device, when a base material energizes solid state lubricant, solid state lubricant is contacted by the first picture support surface.

[0020]In this invention, the above-mentioned equalization means comprises a grounded conductive member (claim 4). Since it comprises a conductive member by which an equalization means (portion which contacts the first [ at least ] picture support) was grounded, the first picture support surface can be discharged. Here, electrical resistance which is a conductive member is  $10^2$ - $10^{10}$  [ $\Omega$ /cm] It is a grade, and fibrous nylon which constitutes an equalization means, polypropylene, an acrylic, or rolled form urethane foam can be made to be able to distribute electric conduction particles, such as carbon, suitably, and it can be considered as a desired electric resistance value. A conductive member may constitute a cleaning blade.

[0021]

[A mode by implementation of an invention] Hereafter, an embodiment of this invention is explained based on an example.

[0022]O Example 1 drawing 1 explains an outline of a color image forming device (printer) which applied a cleaning device concerning this invention. Image formation unit U (Bk, Y, M, C) corresponding to [ roughly divide this image forming device and ] each color of black, yellow, magenta, and cyanogen, A secondary transfer part collectively transferred to a record sheet after piling up a toner image formed of each image formation unit U one by one, A fixing part established on a record sheet in a toner image transferred secondarily and a record seat tray are consisted of by transportation part which conveys a record sheet to predetermined timing through a secondary transfer position and a fixing part.

[0023]Drawing 2 explains composition of an image formation unit of 1 to details more. The photo conductor drum 100 (first picture support) to which this image formation unit holds a toner image on that surface according to a predetermined electrophotography process, The rolled form electrification unit 3 which electrifies the photo conductor drum 100 surface in a predetermined value, and an electrostatic latent image corresponding to each color on the photo conductor drum 100 surface by a laser beam. The exposure device 4 to write in, a developer which forms a toner image in the photo conductor drum 100 surface by making a toner adhere to an electrostatic latent image formed selectively (since it is easy here) the developing roll 50 which are some developers -- being shown. A toner image formed in the photo conductor drum 100 surface. It comprises the cleaning device 1 from which the rolled form primarily transferring device 6 which carries out primarily transferring to an intermediate transfer belt (second picture support), a toner which remained on the photo conductor drum 100 surface without carrying out primarily transferring, etc. are removed, the electric discharger 2 from which potential difference of the photo conductor drum 100 surface is removed, etc. Still more detailed composition of the cleaning device 1 is mentioned later.

[0024]An endless belt shape intermediate transfer belt in which a toner image in which a secondary transfer part is formed with each image formation unit is transferred, It comprises the firm-bridging rolls 21 and 22 of a couple which lays [ firmly ] the intermediate transfer belt by predetermined tension, the secondary transfer roller 23 which confronts each other on both sides of one firm-bridging roll 21 and intermediate transfer belt, etc. One firm-bridging roll 21 contacts a power feeding roll which is not illustrated, is supplied by secondary transfer current and voltage, and with a power feeding roll, one firm-bridging roll 21, the secondary transfer roller 23, etc. A secondary transfer device which transfers a toner image (piled up) secondarily to a record sheet conveyed from an intermediate transfer belt is constituted, and a portion which the secondary transfer roller 23 and an intermediate transfer belt contact serves as a secondary transfer position.

[0025]A fixing part comprises the heating roller 31 which has a heat source inside, the pressure roll 32 which contacts the heating roller 31 by a predetermined pressure, etc.

[0026]The record seat tray 41 in which a transportation part accommodates two or more record sheets, and the pick up roll 42 which takes out at a time one record sheet accommodated in the record seat tray 41, It comprises the carrying roll pair 43 which conveys a taken-out record sheet to a secondary transfer position, a fixing part, and an outlet, a register roll pair which is provided before a secondary transfer position and which are not illustrated, etc. Although the carrying roll pair 43 shows only a couple with this figure, of course according to the length of a conveying path, etc., two or more carrying roll pairs are used suitably.

[0027]Hereafter, formation operation of a full color permanent image by such an image forming device is explained briefly. The photo conductor drum 100 in each image formation unit is rotated in the direction of drawing 2 shown by an arrow, respectively. And the photo conductor drum 100 surface is uniformly charged with the electrification unit 3. And an image formation signal from a personal computer etc. is transmitted to an image forming device via various kinds of networks, and the exposure device 4 irradiates the photo conductor drum 100 surface with a laser beam corresponding to each color based on the image formation signal. Then, potential difference arises on the photo conductor drum 100 surface in a portion exposed by laser beam and a portion which is not exposed, and an electrostatic latent image is formed. To this electrostatic latent image, when each developer 5 makes a toner of each color adhere selectively, a toner image is formed in the photo conductor drum 100 surface.

[0028]A toner image formed in each photo conductor drum 100 surface is transferred one after another to an intermediate transfer belt in a position (primary transfer position) which stands face to face against each primarily transferring roll 6. Namely, in the surface of an intermediate transfer belt which rotates in the direction of an arrow of drawing 1. Primarily transferring of the toner image of black is carried out first, and a full color toner image which primarily transferring was carried out and was piled up is formed in the intermediate transfer belt surface, each toner image of yellow, magenta, and cyanogen moving with rotation of an intermediate transfer belt subsequently, and making it pile each other up one after another.

[0029]The full color toner image moves to a secondary transfer position with rotation of an intermediate transfer belt further. On the other hand, a record sheet accommodated in the record seat tray 41, A full-color-toner image currently formed on an intermediate transfer belt of a register roll pair which it is conveyed and is not illustrated to secondary transfer position this side is conveyance \*\*\*\* to a secondary transfer position via the pick up roll 42 and the carrying roll pair 43 at timing which gives the second order to a translocation. And a full color toner image is electrostatically transferred secondarily by operation of secondary transfer current and voltage produced between the transfer roller 23 and one firm-bridging roll 21 to a record sheet conveyed.

[0030]A toner image full color on the surface a record sheet transferred secondarily, By being conveyed furthermore and passing a nip part which the heating roller 31 and the pressure roll 32 weld by pressure, an operation with heat from both the rolls 31 and 32 and a pressure is fixed to a full color toner image to hold, and it becomes a permanent image by it.

[0031]By the way, a cleaning device concerning this example applicable to such an image forming device, The cleaning blade 11 which contacts the surface of the photo conductor drum 100, A lubricant supplying means which is provided in the downstream of the direction of photo conductor drum rotation rather than the cleaning blade concerned, and supplies lubricant to the photo conductor drum 100 surface, It is provided in the downstream of the direction of photo conductor drum rotation rather than the lubricant supplying means 12 concerned, and has an equalization means to equalize lubricant supplied to the photo conductor drum 100 surface. In the direction of photo conductor drum rotation, it is provided in the downstream rather than the primarily transferring device 6, and this cleaning device is formed in the upstream rather than the electric discharger 2.

[0032]Drawing 3 explains composition of this cleaning device still in detail. While an equalization means is constituted by the braid 13 which contacts the surface of the photo conductor drum 100, this cleaning device, Have the base material (constituted by base material 14 a-c) 14 which forms a closed space on the cleaning blade 11, the braid 13, and the photo conductor drum 100, and a lubricant supplying means, They are the photo conductor drum 100, the cleaning blade 11, the braid 13, and the powder object-like lubricant 12 with which it fills up in a closed space formed of base material 14 a-c.

[0033]The cleaning blade 11 is constituted from this example by polyurethane rubbers, and it is the linear pressure 2.97 to the photo conductor drum 100. Making it contact by [g/mm], the degree of rake angle (cleaning angle) is 9.6. It was considered as counter contact by [\*\*]. Similarly it is constituted by polyurethane rubbers and the braid 13 is the linear pressure 1.37 to the photo conductor drum 100. Making it contact by [g/mm], the degree of rake angle is 11.7. It was considered as counter contact by [\*\*]. In order to form lubricant in homogeneity and a thin layer, the one respectively higher than they of the cleaning blade 11 of a contact angle of the braid 13 and the degree of rake angle is preferred.

[0034]Each base material 14 a-c is constituted by stainless material, using zinc stearate as the powder object-like lubricant 12.

[0035]If a cleaning device of such composition is used, offset toner adhering to the photo conductor drum 100 surface will be held by the cleaning blade 11, and will not pollute the solid state lubricant 12 located more in the downstream. the powder object-like lubricant 12 pushed against the photo conductor drum 100 surface by elastic force of the braid 13 by a moderate pressure -- the photo conductor drum 100 surface -- lubricant -- with \*\* of a certain amount of quantity -- it carries out. The lubricant carried out with \*\* is regulated by quantity of a grade to

which the quantity moreover does not have an adverse effect on electrification, exposure, etc. uniformly with the braid 13 of the downstream more.

[0036]Therefore, a uniform thin film of lubricant will be formed in the surface of the photo conductor drum 100 which passed this cleaning device 1, wear by friction with the cleaning blade 11 or the rolled form electrification unit 2 is controlled, and that life cycle can be prolonged. Even if adhesion force to the photo conductor drum 100 uses a toner near a stronger diameter of a granule, and in the shape of a ball, it can clean without making the cleaning blade 11 contact the photo conductor drum 100 surface strongly.

[0037]The powder object-like lubricant 12 consists of this cleaning device 1 to the photo conductor drum 100, the cleaning blade 11, the braid 13, and a closed space formed of base material 14 a-c, enabling free receipts and payments. Drawing 4 shows the state where the powder object-like lubricant 12 was taken out to the closed space concerned. When pushing this powder object-like lubricant 12, it carries out like an arrow in a figure by inserting an end of the powder object-like lubricant 12 in shaft orientations of the closed space concerned.

[0038]Also when the powder object-like lubricant 12 is exhausted by use by having such composition, what is necessary is to exchange only this powder object-like lubricant 12, and it is economical. The clearing work can also take out the exhausted powder object-like lubricant 12 (aged) from shaft orientations of the closed space concerned, and can perform it easily by inserting the new powder object-like lubricant 12 (new) from shaft orientations of the closed space concerned. Although a graphic display is not carried out, the lap of this new powder object-like lubricant 12 (new) is carried out by a film member, and it is saved, and when using it, it removes and uses that lap member.

[0039]O Modification drawing 5 explains a modification of the cleaning device 1 concerning Example 1, and shows composition of an image formation unit of 1 containing the cleaning device 1 concerned in detail. This cleaning device 1 differs from the cleaning device 1 which requires a point that the braid 13 is what comprises a grounded conductive member for Example 1. This braid 13 has realized a predetermined electric resistance value by carrying out specified quantity distribution of the carbon black to polyurethane rubbers.

[0040]When the cleaning device 1 is constituted in this way, it will have a function in which this braid 13 discharges that surface potential in contact with the photo conductor drum 100 surface. It becomes unnecessary as a result, to be able to discharge electricity more effectively and to form the electric discharger 2 specially depending on the case.

[0041]O Example 2 drawing 6 explains composition of the cleaning device 1 concerning this example in detail. A lubricant supplying means of this cleaning device 1 comprises the solid state lubricant 12a which contacts the photo conductor drum 100 surface, and the base material 12b holding that solid state lubricant 12a. This solid state lubricant 12a hardens zinc stearate, and fabricates it to block like shape, and the base material 12b is constituted by



stainless material. The same numerals are given to the same portion as composition of the cleaning device 1 concerning Example 1, and the explanation is omitted.

[0042]If a cleaning device of such composition is used, non-transfer toner adhering to the photo conductor drum 100 surface will be held by the cleaning blade 11, and will not pollute the solid state lubricant 12a located more in the downstream. the solid state lubricant 12a pushed against the photo conductor drum 100 surface by elastic force of the braid 13 by a moderate pressure -- the photo conductor drum 100 surface -- lubricant -- with \*\* of a certain amount of quantity -- it carries out. The lubricant carried out with \*\* is regulated by quantity of a grade to which the quantity moreover does not have an adverse effect on electrification, exposure, etc. uniformly with the braid 13 of the downstream more.

[0043]A lubricant supplying means is attached, it comprises this cleaning device 1, enabling free removal, and drawing 7 shows the state where a lubricant supplying means was removed. When attaching this lubricant supplying means, like an arrow in a figure, an end of a lubricant supplying means is inserted in shaft orientations of the closed space concerned, and it fixes on both sides of the base material 12b between the base material 14b and c.

[0044]Also when the solid state lubricant 12a is exhausted by use by having such composition, what is necessary is to exchange only this lubricant supplying means, and it is economical. The clearing work can also take out an exhausted lubricant supplying means from shaft orientations of base material 14 a-c, and can perform it easily by inserting a new lubricant supplying means in shaft orientations of base material 14 a-c.

[0045]Drawing 8 explains composition of the cleaning device 1 concerning this example in detail. An equalization means of this cleaning device 1 is constituted by roll which comprises the elastic body layer 13b constituted from a center by the metallic shaft 13a and urethane foam toward a periphery. The same numerals are given to the same portion as composition of the cleaning device 1 concerning Examples 1 and 2, and the explanation is omitted.

[0046]If a cleaning device of such composition is used, non-transfer toner adhering to the photo conductor drum 100 surface will be held by the cleaning blade 11, and will not pollute the solid state lubricant 12a located more in the downstream. the solid state lubricant 12a pushed against the photo conductor drum 100 surface by elastic force of the base material 12b by a moderate pressure -- the photo conductor drum 100 surface -- lubricant -- with \*\* of a certain amount of quantity -- it carries out. The lubricant carried out with \*\* is regulated by quantity of a grade to which the quantity moreover does not have an adverse effect on electrification, exposure, etc. uniformly with the brush roll braid 13 rotated with a drive which the downstream does not illustrate more.

[0047]O Example of an examination In order to check an effect of this invention, an examination which checks maintenance of cleaning performance and a wear preventive effect of picture support was done. First, a toner which prepares an image forming device provided

with a cleaning device concerning Example 1, and the conventional image forming device provided only with a braid as cleaning devices, and is manufactured by an emulsification condensation method under low-humidity/temperature, respectively (mean particle diameter 4.97) [ $\mu\text{m}$ ] Profile coefficient 131.8 [ $\text{ML}^2/\text{A}$ ] A full-color-toner image to depend was formed continuously, and existence of cleaning defect was investigated.

[0048]To cleaning defect having been checked on 200 prints, with an image forming device provided with a cleaning device concerning Example 1, the result was not able to check cleaning defect with the conventional image forming device, even if it exceeded 5000 prints.

[0049]Next, these both-images forming device was worked continuously, and the amount of wear of the picture support (organic photoreceptor) surface in that case was measured. As a result, with the conventional image forming device, the amount of wear is 85. With an image forming device provided with a cleaning device concerning Example 1, the amount of wear is 30 to having been by [ $\text{nm}/\text{kcycle}$ ]. It was by [ $\text{nm}/\text{kcycle}$ ].

[0050]

[Effect of the Invention]As explained to details above, according to this invention, the cleaning device of the image forming device which supplies lubricant of a quantity stable over the long period of time can be provided. As a result, maintenance of cleaning performance and the prevention from wear of picture support can be reconciled on a higher level.

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[Translation done.]